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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/042,304	01/11/2002	Shoham Ben-David	BEN-DAVID=3	7765
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BROWDY AND NEIMARK, P.L.L.C. 624 NINTH STREET, NW SUITE 300 WASHINGTON, DC 20001-5303			EXAMINER GUILL, RUSSELL L	
			ART UNIT	PAPER NUMBER
			2123	

DATE MAILED: 10/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/042,304	<b>Applicant(s)</b> BEN-DAVID ET AL.	
	<b>Examiner</b> Russell L. Guill	<b>Art Unit</b> 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 January 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☐ Claim(s) \_\_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☒ Claim(s) 4,6,10,15,17,21,26,28,32 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/22/2002</u> . | 6) <input type="checkbox"/> Other: _____  |

*(Handwritten mark)*

### DETAILED ACTION

1. Claims 1 - 33 have been examined. Claims 1 - 33 have been rejected.

#### *Claim Objections*

2. **Claims 4, 15 and 26** are objected to because of the following informalities: The claims recite, "the sets". Reference to the previous limitation should remain consistent to avoid any possible confusion or antecedent issues. It appears that "the sets" refers to the "reachable sets" in a previous claim. Appropriate correction is required.

3. **Claims 6, 17 and 28** are objected to because of the following informalities: The claims recite, "the multiple traces". Reference to the previous limitation should remain consistent to avoid any possible confusion or antecedent issues. It appears that "the multiple traces" refers to the "a plurality of mutually-disjoint traces" in a previous claim. Appropriate correction is required.

4. **Claims 10, 21 and 32** are objected to because of the following informalities: The claims recite, "a binary decision diagrams". It appears that "diagrams" should be singular. Appropriate correction is required.

#### *Claim Rejections - 35 USC § 112*

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

- a. **Claims 7, 18 and 29** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims recite, "in the initial set to the state". The sentence appears to be missing a word. For the purpose of

claim interpretation, the phrase is interpreted as "in the initial set to be the state".  
Correction or amendment is required.

- b. **Claim 33** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 33 recites, "A product according to claim 21". For the purpose of claim interpretation, the phrase is interpreted as "A product according to claim 32". Correction or amendment is required.

### *Claim Rejections - 35 USC § 103*

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claims 1 - 33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Beer-On-The-Fly (Beer, Ilan; Ben-David, Shoham; Landver, Avner; "On-The-Fly Model Checking of RCTL Formulas", art provided by the Applicant on the Information Disclosure Statement), in view of Beer-RuleBase (Beer, Ilan; Ben-David, Shoham; Eisner, Cindy; Landver, Avner; "RuleBase: an Industry-Oriented Formal Verification Tool", art provided by the Applicant on the Information Disclosure Statement), further in view of Torrieri (Torrieri, D.; "Algorithms for finding an optimal set of short disjoint paths in a communication network", IEEE Transactions on Communications, Volume 40, Issue 11, Nov. 1992).

- a. **Regarding claims 1, 12 and 23:**

- i. Beer-On-The-Fly appears to teach:

- (1) A method for checking a model, which defines states of a system under study and a transition relation among the states (first page, sections Abstract and 1 Introduction);
  - (2) Specifically regarding claim 23: A computer software product, comprising a computer-readable medium in which program instructions are stored (eighth page, section 4, Experimental results, second paragraph, Rulebase and RS/6000).
  - (3) Specifically regarding claim 12: A model checking apparatus, comprising a model processor (eighth page, section 4, Experimental results, second paragraph, Rulebase and RS/6000).
  - (4) specifying a property that applies to a target set that comprises at least one target state among the states of the system under study (second page, second paragraph that starts with "Even though the original . . . "; it would have been obvious that R is a property of a target set);
  - (5) beginning from an initial set of at least one initial state among the states of the system, computing successive reachable sets comprising the states of the system that are reachable from the initial set (second page, second paragraph that starts with "Even though the original . . . " and third paragraph (especially "reachable state space computation"); it would have been obvious that an initial state was required to run the model);
  - (6) finding an intersection between one of the reachable sets and the target set (second page, second paragraph that starts with "Even though the original . . . " and third paragraph; it would have been obvious that checking whether  $A(R)$  enters the state  $match_r$  is finding an intersection between a reachable set and a target set);
- ii. Beer-On-The-Fly does not specifically teach:

- (1) computing a plurality of mutually-disjoint traces from the at least one target state in the intersection through the states in the reachable sets to the at least one initial state.
- iii. Beer-RuleBase appears to teach:
  - (1) computing a trace from the at least one target state in the intersection through the states in the reachable sets to the at least one initial state (second page, section 2.4 Debugging).
- iv. Torrieri appears to teach:
  - (1) a plurality of mutually-disjoint paths through a graph (page 1698, section I. Introduction, first paragraph).
- v. Beer-On-The-Fly and Beer-RuleBase are analogous art because they both are directed to the art of model checking.
- vi. Beer-On-The-Fly and Torrieri are analogous art because they both contain the problem of finding paths through a graph (Beer-On-The-Fly, second page, section 2.4 Debugging; and fourth page, section Witness and Vacuity, execution trace of a non-trivial path) and (Torrieri, page 1698, section I. Introduction, first paragraph).
- vii. The motivation to use the art of Beer-RuleBase with the art of Beer-On-The-Fly would have been the benefit recited in Beer-RuleBase that RuleBase offers usability features, and capacity and robustness features that make it an industrial-strength formal verification tool (first page, section 1 Introduction, second paragraph).
- viii. The motivation to use the art of Torrieri with the art of Beer-On-The-Fly would have been the benefit recited in Torrieri that an efficient algorithm was developed to construct an optimal set of short disjoint paths (page 1699, section III. Fast Pathfinding Algorithm), which would have obviously been beneficial in finding the execution trace in Beer-On-The-Fly.

- ix. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Beer-RuleBase and the art of Beer-RuleBase with the art of Beer-On-The-Fly to produce the claimed invention.

**b. Regarding claims 2, 13 and 24:**

- i. Beer-On-The-Fly does not specifically teach:
- (1) specifying a condition that is expected to be true over all of the reachable states of the system under study, and wherein the condition is false in the at least one target state.
- ii. Beer-Rulebase appears to teach:
- (1) specifying a condition that is expected to be true over all of the reachable states of the system under study, and wherein the condition is false in the at least one target state (second page, section 2.4 Debugging).

**c. Regarding claims 3, 14 and 25:**

- i. Beer-On-The-Fly does not specifically teach:
- (1) specifying a condition representing a desired behavior of the system under study, such that the condition is fulfilled in the at least one target state.
- ii. Beer-Rulebase appears to teach:
- (1) specifying a condition representing a desired behavior of the system under study, such that the condition is fulfilled in the at least one target state (fourth page, section Witness and Vacuity, first paragraph).

**d. Regarding claims 4, 15 and 26:**

- i. Beer-On-The-Fly appears to teach:

- (1) testing the property while computing the sets, and ceasing to compute the sets when the intersection is found (second page, second and third paragraphs, especially the third paragraph that starts with "This check can ...").

e. Regarding claims 5, 16 and 27:

- i. Beer-On-The-Fly appears to teach:
  - (1) determining a first one of the reachable sets, disjoint from the initial set, such that all of the states in the first one of the reachable sets are reached from the at least one initial state in a first cycle of the transition relation (second page, second and third paragraphs, especially the third paragraph that starts with "This check can ...");
  - (2) determining the successive reachable sets, following the first one of the reachable sets, such that all of the states in each of the reachable sets are reached from the states in a preceding one of the reachable sets in a successive cycle of the transition relation, and so that each of the successive reachable sets is disjoint from the initial set and from the other reachable sets determined before it (second page, second and third paragraphs, especially the third paragraph that starts with "This check can ...").

f. Regarding claims 6, 17 and 28:

- i. Beer-On-The-Fly does not specifically teach:
  - (1) for each trace among the multiple traces, selecting one of the states from each of the successive reachable sets
- ii. Beer-Rulebase appears to teach:



- (1) for each trace among the multiple traces, selecting one of the states from each of the successive reachable sets (fourth page, section Witness and Vacuity, first paragraph).

g. Regarding claims 7, 18 and 29:

- i. Beer-On-The-Fly does not specifically teach:
  - (1) for each of the selected states, choosing a predecessor state among the states in a preceding one of the reachable sets until the state on the trace in the first one of the reachable sets is found, and choosing the predecessor state in the initial set to the state in the first one of the reachable sets
- ii. Beer-Rulebase appears to teach:
  - (1) for each of the selected states, choosing a predecessor state among the states in a preceding one of the reachable sets until the state on the trace in the first one of the reachable sets is found, and choosing the predecessor state in the initial set to the state in the first one of the reachable sets (fourth page, section Witness and Vacuity, first paragraph).

h. Regarding claims 8, 19 and 30:

- i. Beer-On-The-Fly does not specifically teach:
  - (1) on each of the traces computed after a first one of the traces, choosing the predecessor state so as to maximize a distance of the trace from the other traces already computed.
- ii. Torreiri appears to teach:
  - (1) on each of the traces computed after a first one of the traces, choosing the predecessor state so as to maximize a distance of the trace from the other traces already computed (page 1699, section III. Fast Pathfinding Algorithm, first paragraph).

i. **Regarding claims 9, 20 and 31:**

- i. Beer-On-The-Fly does not specifically teach:
  - (1) selecting the states on each trace among the multiple traces so as to maximize a distance of the trace from the other traces already computed.
- ii. Torreiri appears to teach:
  - (1) selecting the states on each trace among the multiple traces so as to maximize a distance of the trace from the other traces already computed (page 1699, section III. Fast Pathfinding Algorithm, first paragraph).

j. **Regarding claims 10, 21 and 32:**

- i. Beer-On-The-Fly appears to teach:
  - (1) each of the states is represented by a binary decision diagrams (BDD) (first page , section 1 Introduction, first paragraph) and wherein selecting the states on each trace comprises maximizing the distance between the BDD representing the state to be selected and the BDD representing the states on the other traces (first page , section 1 Introduction, first paragraph).

k. **Regarding claims 11, 22 and 33:**

- i. Beer-On-The-Fly appears to teach:
  - (1) taking a left trial state and a right trial state on left and right branches, respectively, of the BDD representing the state to be selected (first page , section 1 Introduction, first paragraph); and
  - (2) choosing the trial state that has a larger Hamming distance from the BDD representing the states on the other traces (first page , section 1 Introduction, first paragraph).

*Conclusion*

8. **Examiner's Note:** Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell L. Guill whose telephone number is 571-272-7955. The examiner can normally be reached on Monday - Friday 9:00 AM - 5:30 PM.


10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any inquiry of a general nature or relating to the status of this application should be directed to the TC2100 Group Receptionist: 571-272-2100.

Art Unit: 2123

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Russ Guill  
Examiner  
Art Unit 2123

RG

  
Paul L. Rodriguez 9/25/05  
Primary Examiner  
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